

# Department of the Navy Information Technology Infrastructure Architecture

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***Volume I***  
***Network Infrastructure and***  
***Services Architecture***

Department of the Navy Chief Information Officer (DON CIO)  
Information Technology Infrastructure Integrated Product Team (ITI IPT)

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# **1. Introduction**

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## **1.1 Document Purpose**

This document defines the Department of the Navy (DON) network architecture. The network architecture is part of the DON Information Technology Infrastructure (ITI) Architecture. It provides the basis to produce a secure, interoperable, and robust DON enterprise networking capability. This document, Volume I - Network Infrastructure and Services Architecture, describes the network connectivity and network services, the Wide Area Network Connectivity Plan, the Metropolitan Area Network Design Template, the Campus Area Network Design Template, and an Information Technology Services Center (ITSC) Template.

Volume II- Enterprise Architecture Framework, is a separate publication which identifies the overarching comprehensive set of models that positions the DON ITI Architecture to support the operational requirements of DON. It further identifies the additional components of the ITI, specifically, the Workgroup Computing Architecture and the Server Architecture. The network infrastructure and services architecture described in this document are the first instantiations of the framework. Other architecture components will be developed in subsequent efforts.

This document provides the guidance for planning, developing, implementing, and operating all activities associated with DON IT network infrastructure. It is to be used by DON acquisition programs, organizations, working groups, and Integrated Product Teams (IPTs) to facilitate convergence on a single, comprehensive ITI architecture. This guidance and associated design templates are not intended to be detailed design and implementation plans, but to serve as frames of reference for design and implementation efforts.

## **1.2 Document Structure**

Volume I consists of four chapters that describe the components and relationships of the building blocks of the enterprise architecture. It also provides the strategy and guidance for implementing wide area, metropolitan, and campus networks and a series of architecture templates that provide the planners and implementers with a tool for actual implementation. Specifically, they are as follows:

**Chapter 1** places the ITI Volume I into the context of the overarching Enterprise Architecture Framework (EAF). It introduces the components that represent the building blocks of the enterprise architecture.

**Chapter 2** describes the aggregation of DON network infrastructure requirements, including the large diverse group of tactical and functional users, mission systems, multiple operational areas, and all types of media.

**Chapter 3** contains four major subsections:

- It introduces the basic planning construct for a global enterprise vision of the DON network connectivity architecture – the underlying connectivity grid, the autonomous networks supporting specific functions or technologies or security needs, and the communities of interest (CoI) used to logically group user processes and requirements.
- It provides a high-level overview of the DON ITI connectivity architecture that addresses both Asynchronous Transfer Mode (ATM) and Internet Protocol (IP), their individual strategies, and their interrelationships.

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- It addresses the detailed ATM connectivity architecture. ATM technology forms the principal technology for the enterprise architecture. This enables the consolidation of voice, video, and data onto a single network and offers the advantages of scalability, speed, quality of service, economy, and interoperability. Included here are the pertinent protocols and references that are essential for successful ATM implementation.
- It addresses the detailed Internet Protocol (IP) connectivity architecture. IP-based connectivity components comprise a significant portion of the ITI. Support of IP in the ATM environment is an area of major focus. A number of protocols and references which are necessary to support IP networking are outlined here.

**Chapter 4** provides a description of the basic network services that users require in all functional areas to be accessible from the network. All network services must have a common planning framework and consistent implementation strategy. Some services must be implemented under an enterprise plan.

There are a series of five networking-related appendices that are designed for use by planners for specific implementations. There is also an appendix that acknowledges the contributors to this document and provides point of contacts for particular subject areas.

**Appendix A** outlines the strategy, planning factors, and steps required to build a DON WAN.

**Appendix B** presents the design template required to plan a MAN, including supporting protocols, security, and management.

**Appendix C** presents the design template required to plan a campus network, including supporting protocols, security, and management. The term campus area network includes shipboard networks. Differences from shipboard and terrestrial campus are shown by exception.

**Appendix D** provides detailed guidance on the functions and processes that will be performed by the ITSC. A series of ITSCs will support shipboard and terrestrial requirements for voice, video, and data.

**Appendix E** provides an overview of the network security Defense in Depth model and describes the mechanisms that provide protection at the four layers.

**Appendix F** lists the contributors to this document.

### **1.3 Strategic Drivers**

An ITI Architecture provides the foundation for robust DON enterprise-wide ITI. Four major strategic forces are driving the need for this robust infrastructure.

- Dependency on ITI to achieve Naval information superiority and the potential of ITI to support a revolution in military affairs (RMA) and revolution in business affairs (RBA).
- Alignment of ITI investment initiatives to produce a more focused, efficient, and holistic approach to building and operating the DON enterprise infrastructure.
- The need to correct the current imbalance in resources applied to combat programs versus combat support programs.

- The requirement to implement the Clinger-Cohen Act of 1996 and Office of Management and Budget Memorandum 97-16.

## **1.4 Positioning the ITI in the Enterprise Architecture Framework**

The Enterprise Architecture Framework (EAF), introduced in Volume II, provides the context for describing a DON enterprise architecture through a unified and common set of reference models. These models provide a basis for describing a design target and coordinating changes across the enterprise infrastructure, the functional areas, and the joint/allied communities.

### **1.4.1 Introduction to Enterprise Architecture Framework**

The DON is a complex, multi-business industry that combines the major elements of warfighting with a wide array of combat support activities, including research and development, engineering, transportation, acquisition, distribution, meteorology, education, healthcare, hospitality, and municipal services. The transformation of the IT services that support these functions requires a shift in DON IT strategic planning to a more interoperable, flexible, and secure IT infrastructure, more leveraging of emerging resources, improved management and communication systems, and new ways to support the warfighter with much fewer resources.

The management, organizational, and technological challenges that must be negotiated to produce a transformational shift are dynamic, complex, and intertwined. The EAF provides an overall structure, elements, and concepts to plan, prioritize opportunities, integrate plans, coordinate implementation strategies, and communicate changes.

Key portions of the EAF are the templates that support various ITI planning and design across DON communities. A template is a pre-structured approach for defining and collecting the information used by a planning or design activity. The templates enable capture of recognized commonalties in requirements and solutions across the enterprise. They provide widely-applicable architecture designs that enable reduction of planning efforts, opportunities to leverage or share solutions, and shorter implementation periods. By adopting a common framework to integrate all of the models and components related to ITI planning, various DON communities can better communicate their requirements and ideas. The end result is an EAF populated with DON-specific components that supports many ongoing planning activities for enterprise solutions.

Figure 1-1 summarizes the transformation from vision to operational capability as supported by the architecture models and templates.

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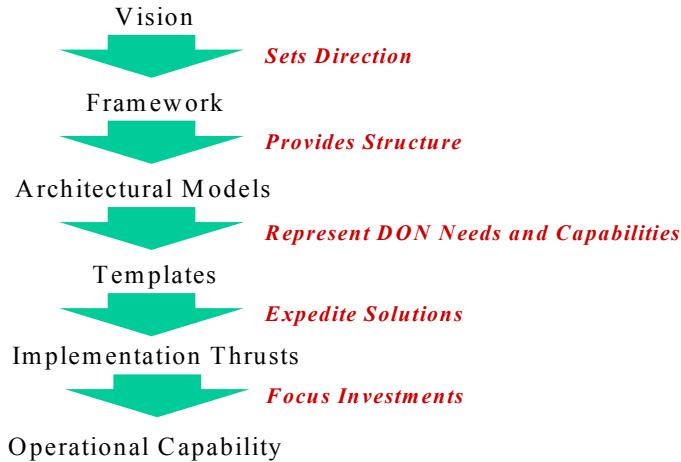


Figure 1-1. Enterprise Architecture Framework Process

The DoD C4ISR Framework, Version 2.0, which provides the basis for the DON EAF, consists of three different architecture views - Operational, Systems, and Technical. The DON EAF introduces a fourth – Mission view – which defines the strategic mission requirement. This is depicted in Figure 1-2 and is fully described in Volume II.

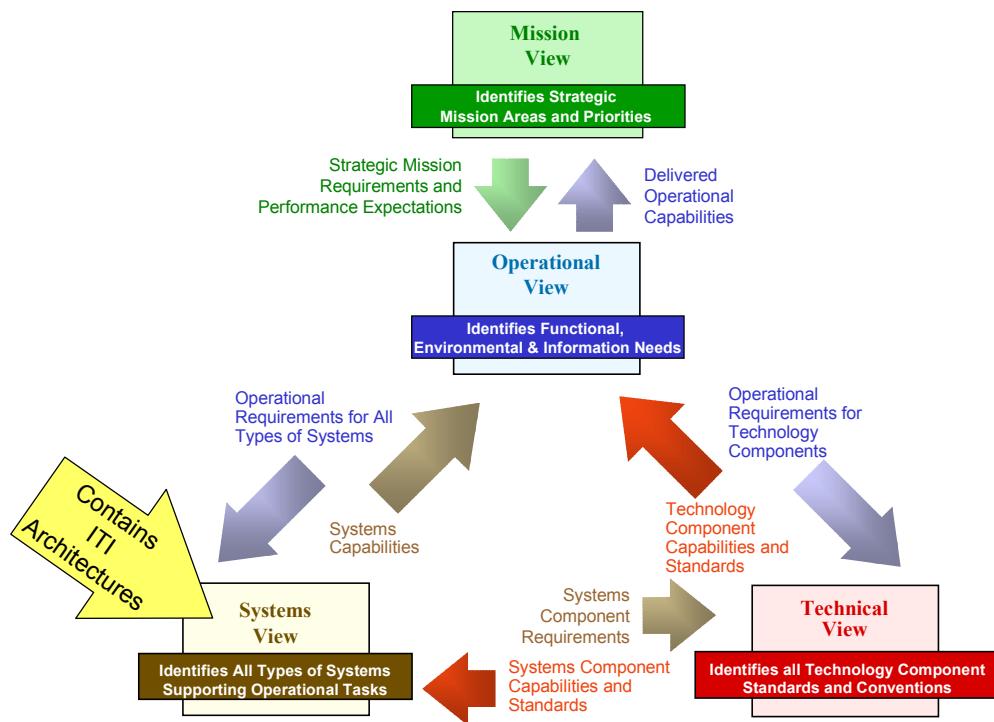


Figure 1-2. DON Architecture Framework

Each of these four views has an inter-related set of requirements and capabilities flows that interact to produce the required set of enterprise capabilities. All four views are important in determining and describing information requirements; matching those to an appropriate mix of technology solutions; and performing the required planning, design, and integration of the IT Infrastructure (ITI). The Systems

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View is most relevant to the ITI architecture. By “drilling down” in the Systems View, a more detailed view of the underlying subsystems is revealed. Figure 1-3 shows this Sub-Systems View.

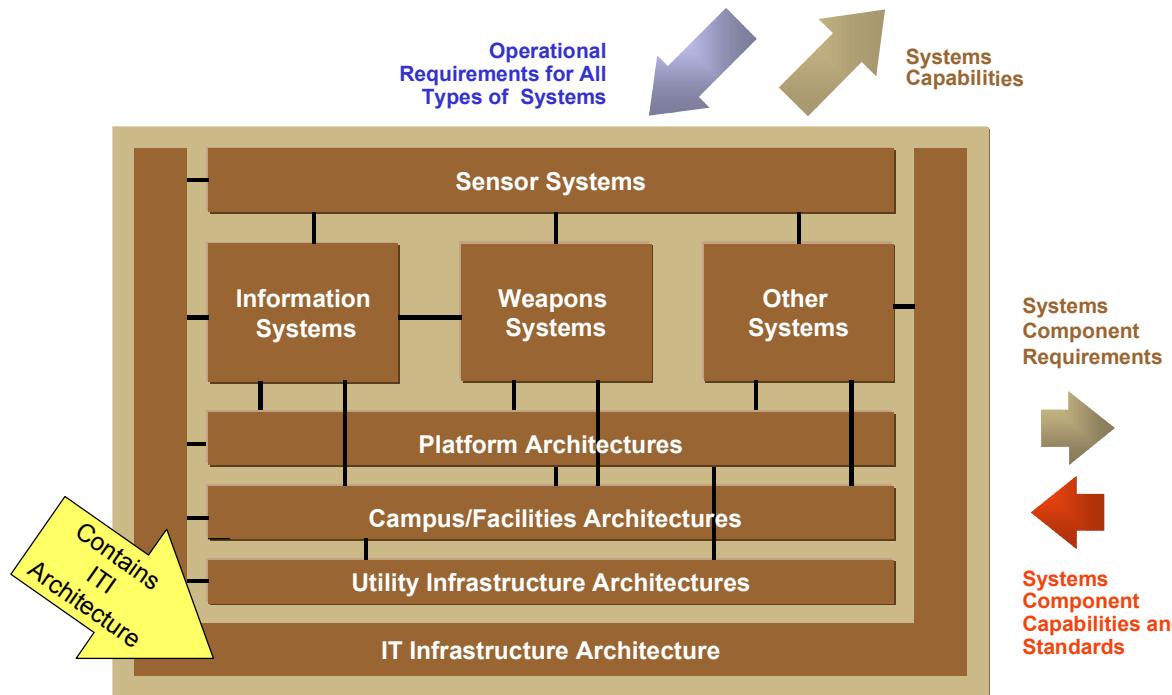


Figure 1-3. Systems View Showing Sub-Systems Views

There are a number of distinct but inter-related sub-systems which work together to produce the required operational capabilities.

- Sensor systems provide overall surveillance and data collection capabilities required to support the planners, commanders, and warfighters. Collectively, various sensor systems combine to produce information products required by various user communities.
- Information systems include all types of information processing and management applications. These are generally specific to Communities of Interest (e.g., logistics) or common across the DON.
- Weapon systems are a distinct class of systems including propulsion, guidance, and payload capabilities, all of which may imbed information technologies as part of their respective control systems.
- Other systems include simulators, trainers, robots, materiel handling systems, and other sensor-based and/or real time systems with special user interfaces.
- Platforms, including ships, planes, spacecraft, amphibious units, and vehicles, are also recognized as a distinct class of transportation systems. Similarly, campuses and facilities are also viewed as “land and building systems” with their own classes, components, and relationships. The utility infrastructure, including power, HVAC, water, and sewage, is further defined as a sub-view in support of platforms and campuses/facilities.

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- The ITI Architecture supports all of the above sub-systems and directly interfaces with various user communities in the operating areas.

Figure 1-4 takes the bottom ITI Architecture Sub-view (of Figure 1-3) and drills down an additional level of detail. The components of the ITI are presented as the IT Infrastructure Sub-view. The ITI Architecture provides all of the common information access, management, and exchange services required by information systems and users of information technologies.

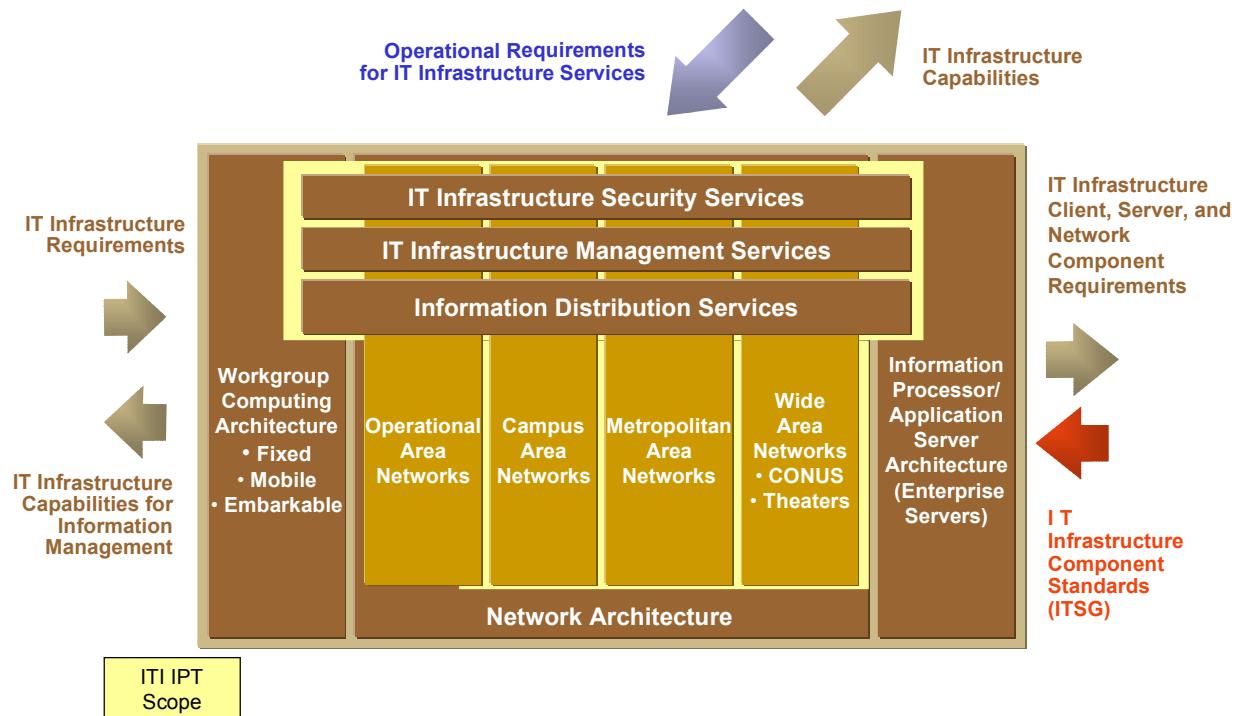


Figure 1-4. IT Infrastructure Sub-view

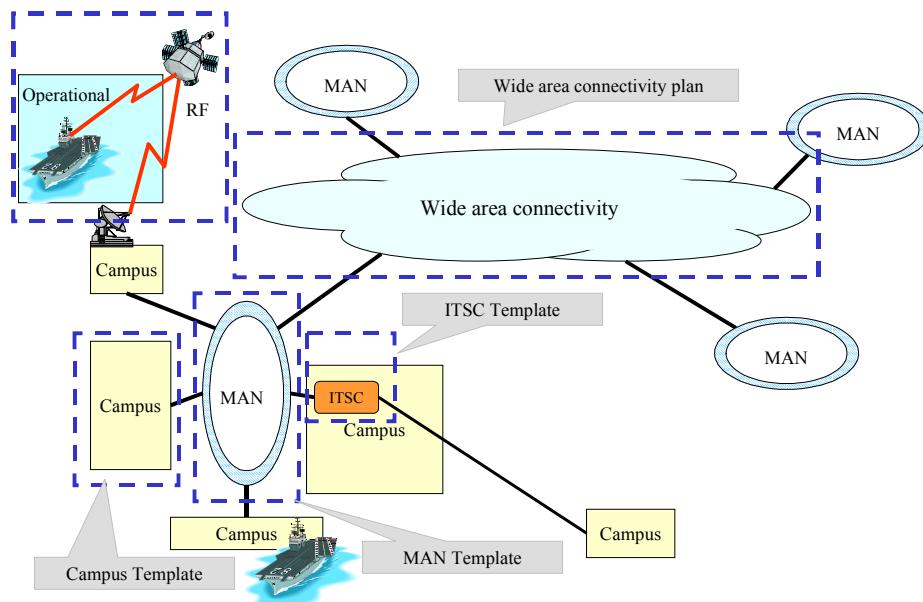
The three underlying component architectures are the Workgroup Computing Architecture, the Network Architecture, and Server Architecture. The Workgroup Computing Architecture addresses workstations, peripheral devices, workgroup servers, and LANs. The Server Architecture addresses the multi-tiered structure of information and application processors and storage devices. The Network Architecture addresses the connectivity between workgroup devices and servers across the three levels of networks supporting ashore, afloat, and expeditionary communities.

This underlying Network Architecture capability is overlaid with three end-to-end infrastructure services, including information distribution services, IT infrastructure management services, and IT infrastructure security services.

- Information distribution services provide for various types of information exchange and communication services across the ITI.
- IT infrastructure management services provide performance- and service-level management capabilities plus other operational services.
- IT infrastructure security services provide for the stringent requirements for controlled access and information protection across the ITI for the various levels of security.

### **1.4.2 From Framework to ITI Architecture**

Volume I addresses the network portion of the ITI architecture highlighted in yellow in Figure 1-4. It includes ITI security services, ITI management services, and information distribution services in conjunction with Campus, Metropolitan, and Wide Area Networks. Operational Area Networks support platform and expeditionary networking requirements. Operational Area Networks are not fully addressed in this document. They will be the subject of a future ITI document version. The ITI Network Architecture deliverables are depicted in Figure 1-1.



**Figure 1-1 ITI. Architecture Templates and Plans**

The deliverables include the following: Wide Area Network (WAN) Plan, Metropolitan Area Networks (MANs) Template, Campus Area Networks (CANs) Template, and Information Technology Service Centers (ITSCs) Template. These deliverables represent the building blocks of the enterprise network. These are addressed in detail the remaining chapters and appendices of this document.